

Life Support for Trauma and Transport (LSTAT) Patient Care Platform: Expanding Global Applications and Impact

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ABSTRACT

The Life Support for Trauma and Transport (LSTAT™) patient care platform looks like a stretcher, but is actually a portable intensive care unit and surgical platform only 15 cm thick. The LSTAT platform has recently been employed in ground based tactical situations ranging from Operation Iraqi Freedom to a humanitarian mission in Cambodia. There is a growing body of evidence to suggest that, compared to conventional methods, the LSTAT platform improves the efficiency and effectiveness of care from the site of injury, through transport and definitive surgical care. In addition to use by the U.S. military, other nation's military medical communities have begun acquiring LSTAT platforms, as well. The platform is cleared by the U.S Food and Drug Administration, as well as CE Mark authorities for the purchase and use of the platform by EU nations. The LSTAT also has received limited fleetwide airworthiness clearance by the U.S. Army and U.S Air Force.

By integrating multiple medical, data and utility capabilities into a single compact and light weight system, continuous treatment and monitoring can be provided across the continuum of care on land, air or sea. Therefore, there is little need to disconnect the patient from therapy and monitoring, resulting in the consumption of less time and resources, simplified logistics, and the prospect of improved clinical outcomes. The integrated nature of the platform also accommodates more rapid technology insertion, such as closed loop control of ventilation, infusion and other therapies.

The LSTAT platform has been deployed operationally to a number of austere military environments around the globe by medical components of the U.S. Army, Navy, Air Force, Special Operations Forces, and National Guard. Preliminary qualitative and quantitative data is being collected to validate the benefits of the platform in both pre-hospital and in-hospital applications.

Preliminary data indicates the LSTAT platform is preferred by some medical personnel over conventional methods for the treatment and transport of critically injured patients in certain applications.

1.0 INTRODUCTION

After Desert Storm I, the U.S. military medical leadership agreed upon the need for a ‘trauma pod’: an evacuation platform that would provide life support from as close to the site of injury as possible, through transport and into definitive care. They tasked the U.S. Defense Research Projects Agency (DARPA) to solicit

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industry for the development of this ‘trauma pod’. In 1994, DARPA ultimately selected the Northrop Grumman Corporation (NGC) because NGC was a ‘systems integrator’; that is, a company skilled in the art and science of combining discrete devices onto single power and data busses usually within a single platform (e.g., an aircraft cockpit), while at the same time reducing their total weight and volume. NGC moved forward to develop, in collaboration with the Walter Reed Army Institute of Research (WRAIR), the LSTAT patient care platform. After achieving U.S Food and Drug Administration clearance on the LSTAT in 1998, NGC launched a separate company to build, sell and service the LSTAT platform. This new company is Integrated Medical Systems, Inc. The economic and operational user benefits resulting from a systems integration approach have proven well worth the investment in the automotive, aerospace/defense, and computer communities. The purpose of this paper is to suggest the same user benefits can accrue through the systems integration of medical devices, particularly for the weight- and volume-sensitive international military medical applications.



Figure 1: Life Support for Trauma and Transport (LSTAT) Patient Care Platform

1.1 Research Problem

The research problem to be addressed is whether the benefits of an integrated patient care platform can be extended successfully to multiple environments; multiple vehicles and facilities (air, land and sea); and to multiple international medical communities. Given that such communities are faced with practically the same types and severities of casualties, requiring the same types of treatments, standardization has long been goal, particularly among NATO nations.

1.1.1 Basis for Standardization

According to the NATO Handbook¹, regarding the Committee of the Chiefs of Military Medical Services (COMEDS):

“The objectives of the COMEDS include improving and expanding arrangements between member countries for coordination, standardisation and interoperability in the medical field....”

A similar objective exists for the Partnership for Peace nations. Again, according to the NATO Handbook:

“In 2001, the COMEDS Plenary Meeting set up a Standing Group of Partners Medical Experts. In cooperation with the Strategic Commanders, this will provide a forum where medical assets and capabilities, PfP goals, and medical pre-arrangements will be addressed.”

¹ NATO Handbook, Chapter 14: Key to Organisations and Agencies and Other Subordinate Bodies, [The Committee of the Chiefs of Military Medical Services in NATO \(COMEDS\)](#). June 2004.

2.0 METHODS

The methods employed were to provide LSTAT platforms to various military (and in limited cases, civilian) medical groups, with a goal of placing LSTATs in evaluations, exercises, and/or operational use in air, land and sea vehicles, and fixed facilities; as well as in a variety of climatic environments. Such assessments included human and non-human use; the latter to confirm mechanical, electrical, gas, logistics and other equipment and process interfaces. Users were then requested to provide quantitative and qualitative written and photographic evidence of their use. Since operational demands often made this difficult, this method was augmented by an LSTAT Users Conference in San Antonio, Texas (USA) in October 2002, where medical personnel made oral presentations on their experience with the LSTAT platform. LSTATs continue to be deployed, and data gathered, as of the date of this publication.

2.1 LSTAT Applications

The types of military medical applications involving LSTATs in evaluations, exercises and/or operational use have included

- Battalion Aid Station (BAS) – Photo courtesy of the U.S Army



- Mobile Army Surgical Hospital (MASH) - Photo courtesy of the U.S Army



- Aeromedical evacuation (rotary and fixed wing) – Right photo, courtesy of the U.S Navy



- Forward Surgical Team (FST) - Photo courtesy of the U.S Army



- Amphibious Assault/Casualty Receiving Transport ship – Photos courtesy of the U.S. Navy



- Military support to civilian casualties (landmine victims) - Photos courtesy of the U.S Army



- Civilian private academic medical center (post-anesthesia critical care unit and intra-hospital transport)



- Civilian public medical center - Photos courtesy of LAC+USC Medical Center



3.0 RESULTS

The LSTAT platform has been shown to operate successfully in a variety of environments, on a variety of platforms, by a variety of international military medical personnel, and with a variety of patients along the continuum of care, including surgery, general anesthesia as well as equipment maintenance and repair.

Specific findings repeatedly confirmed include:

1. LSTAT is suitable for use in most healthcare support applications.
2. LSTAT's data acquisition system relieves much of the burden of documentation.
3. LSTAT's data acquisition system reduces the number clinical specialists needed bedside and during transport.
4. LSTAT meets or exceeds the requirements of the American College of Critical Care Medicine guidelines for the transport of critical patients.
5. LSTAT weight does not negatively impact mission performance in most operational environments.

4.0 DISCUSSION

Through the convergence of advancing technology and the demands for interoperability, integrated medical platforms hold the prospect of becoming as standardized as the simple litter/stretcher. Ongoing reductions in weight and volume, together with increasing medical, data and utility capabilities, allow medical forces from multiple nations to share the common benefit of earlier, continuous, and flexible care to the combat casualty.

4.1 Significance to NATO

As coalitions increase in size and number, and as they are employed more frequently, efficient and effective combat casualty care will depend on standardization not only of processes and procedures, and not only of simple medical equipment such as bandages and litters, but of medical, data, and utility devices, as well. Just as NATO and PfP nations can share integrated aircraft platforms, they can now share integrated patient platforms.

5.0 CONCLUSIONS/RECOMMENDATIONS

Initial indications are that some international military medical forces prefer the benefits of an integrated patient platform. However, validation of this conclusion, and of the specific clinical and economic benefits, require additional evaluation through demonstrations, exercises and actual operational use, with an emphasis on gathering and analyzing quantitative data.